HACETTEPE UNIVERSITY
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

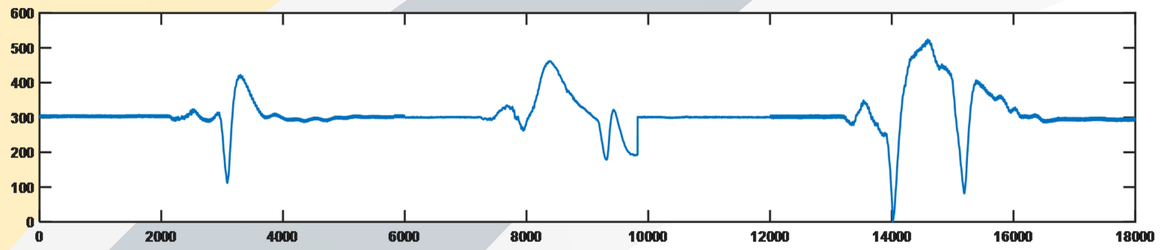
ELE 401-402 GRADUATION PROJECT
IMPROVEMENT OF MYOELECTRIC UNDERACTUATED HAND

Project Supervisor:
Dr. Atila YILMAZ
Project Members:
Beste ÖNAL - 21628626
Ecem KARAHİSAR - 21229517
Ferhat İŞERİ - 21628411

INTRODUCTION

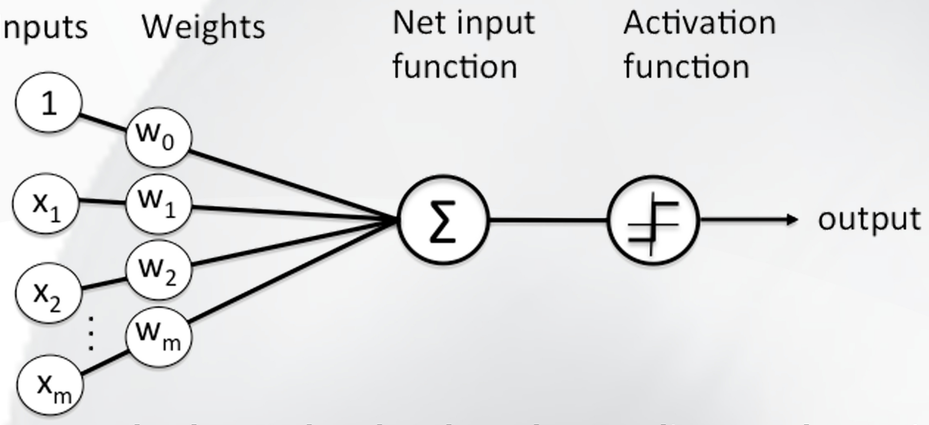
Today, individuals can lose their hands permanently due to various reasons. In order to minimize the effects of these losses, many prostheses have been used from past to present. Myoelectric hand prostheses are at the forefront of these methods. These prostheses are used to overcome the limitations of individuals due to losses.

In underactuated hand prostheses, EMG signals, which is one of the common signal acquisition methods, are used to control the movements of individuals. Taking into account their functionality and ease of use, EMG controlled prosthetic devices have considerable advantages and a high potential of improvement. In our project, we tried to obtain the most consistent result for the classification of EMG signals received from individuals with the help of artificial intelligence.



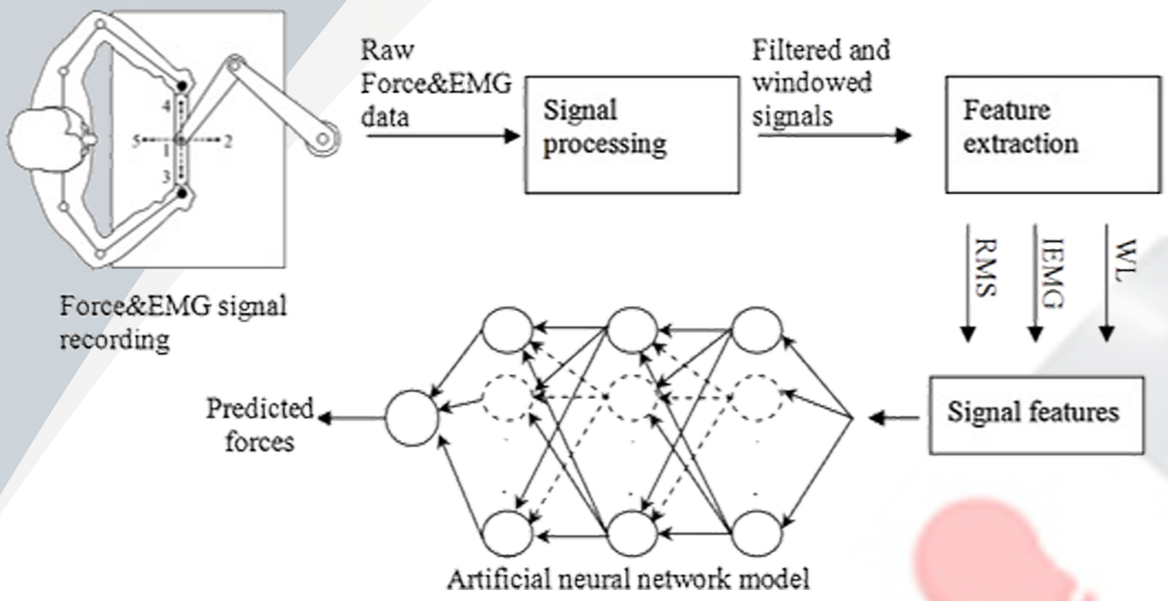
METHODOLOGY

The classification of EMG signals is very important in our project. We use ANN to perform this operation. A neural network is a series of algorithms that endeavors to recognize underlying relationships in a set of data through a process that mimics the way the human brain operates. Also, Neural networks help to group unlabeled data according to similarities among the example inputs, and they classify data when they have a labeled dataset to train on.



Different methods can be developed according to the activation function in neural network. Methods we are studied are :
1-RBF 2-MLP 3-SVM

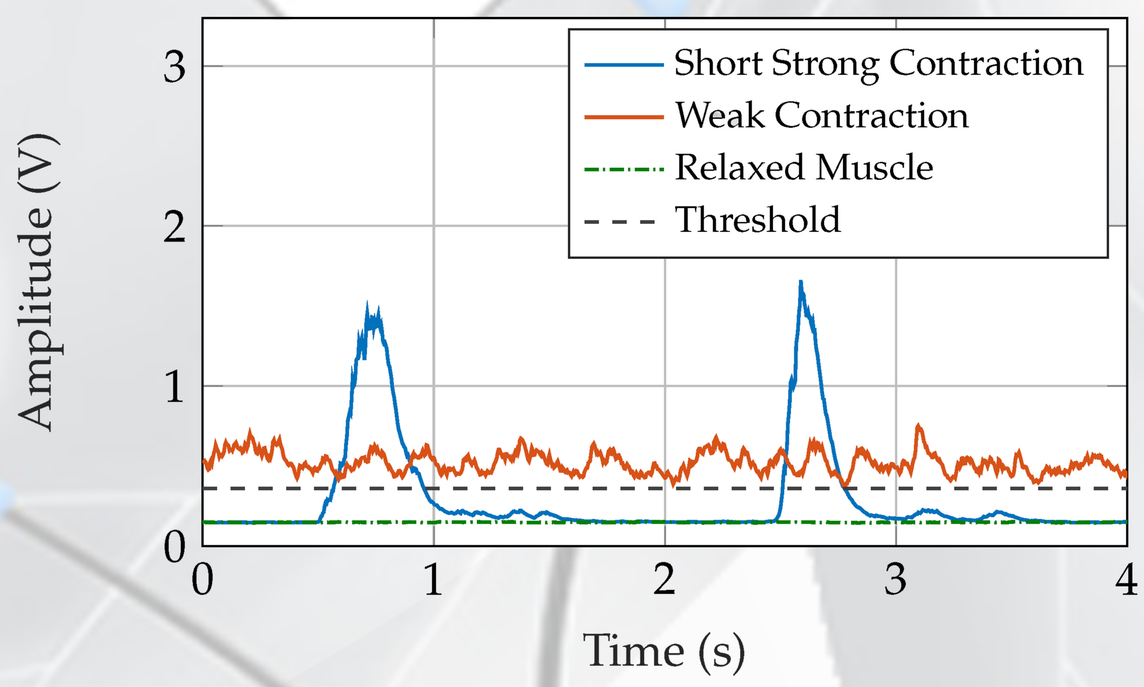
TEST PLATFORM



STEP1 : Obtaining EMG signals with the help of sensor
STEP2: Transferring of EMG signals to MATLAB platform
STEP3: Training the classifier in accordance with the data set created with EMG signals
STEP4 : Testing the classifier

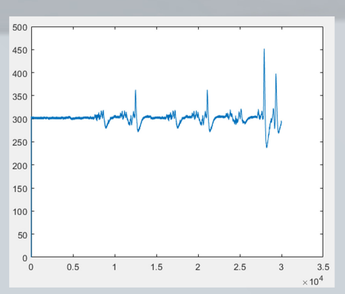
EMG SIGNAL PROPERTIES

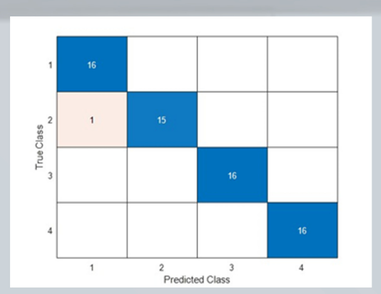
Electromyography (EMG) is an e technique for evaluating and recording the electrical activity produced by skeletal muscles. Also, it detects the muscle signal, which is commonly detected by electrode pairs with the purpose of extracting information. EMG can be invasive and noninvasive.

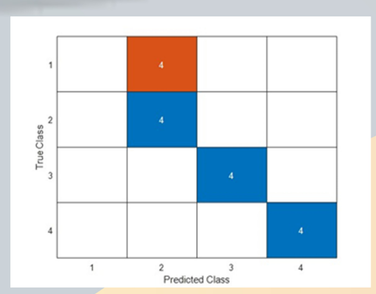


CONCLUSION

The signals prepared with 20 repetitions for each movement from a single user were filtered and the feature vectors of the signals were extracted. A data set was created with these data and the network was trained. When this network was tested, 75% success was achieved. Then the real time data of the user is received. At the same time, these signals were sent to the network, which was separately prepared with a certain window size. The result obtained allowed the user to define the movement determined instantly.







REFERENCE

Zehit Evren Kaya,J.(2020). Modeling And Simulation of an Anthropomorphic Hand Prosthesis with an Object Interaction. Ankara: University of Hacettepe

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